Supplement of "Spatiotemporal profiles of ultrafine particles differ from other traffic-related air pollutants: Lessons from long-term measurements at fixed sites and mobile monitoring"

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Table S1 Site details for for near-highway, urban, suburban, and rural sites including range of measurement period, distance from nearest highway/road, annual average daily traffic (AADT) at the nearest highway/road, and the traffic related air pollutants measured.

	Measurement period range	Nearest highway		Nearest road		Pollutants measured
		Distance (m)	AADT (–)	Distance (m)	AADT (–)	
Near-highway[a]	Feb 2014–Jan 2018	20	249000	–	–	PN, NO_x, BC, CO
Urban[b]	Jul 2011–Jan 2018	450	221000	13	1200	PN, NO_x, CO
Suburban[c]	May 2012–Jan 2018	1300	202000	68	3100	PN, NO_x, BC
Rural[d]	Jan 2014–Dec 2017	70	56000	80	1100	PN, NO_x, CO

[a] Laney College: Trailer adjacent to major highway (Interstate 880).
[b] Redwood City: One-story commercial building.
[c] Livermore: One-story commercial building.
[d] Sebastopol: Two-story commercial building.

Table S2 Spearman correlation (r_s) between PN and NO_x for near-highway, urban, suburban, and rural sites calculated by season (high NPF, low NPF months, and all seasons) and time-of-day (daytime, nighttime, and entire day). Hourly data of TRAP concentrations for the entire duration of monitoring was used for the calculations.

	High NPF			Low NPF			All		
	Day	Night	All	Day	Night	All	Day	Night	All
Near-highway	0.59	0.84	0.79	0.77	0.65	0.71	0.66	0.72	0.72
Urban	0.53	0.77	0.59	0.66	0.75	0.70	0.57	0.81	0.66
Suburban	0.01	0.80	0.23	0.56	0.74	0.69	0.26	0.84	0.49
Rural	0.34	0.80	0.60	0.64	0.78	0.73	0.51	0.86	0.69

Table S3 Spearman correlation (r_s) between PN and NO_x for on-road measurements (highways, arterials, and residential roads) calculated by season (high NPF, low NPF months, and all seasons). The correlations calculation were based on the median of drive pass means by road type (time-averaged) of PN and NO_x. The mobile monitoring data was only collected during the daytime. (All 12 domains, selected days from 100×100)

	High NPF	Low NPF	All
Highways	0.66	0.79	0.81
Arterials	0.47	0.57	0.66
Residential	0.45	0.55	0.67

Table S4 Spearman correlation (r_s) between PN and NO_x for on-road measurements (highways, arterials, and residential roads) calculated by season (high NPF, low NPF months, and all seasons). The correlations calculation were based on the median of drive pass means by road type (time-averaged) of PN and NO_x. The mobile monitoring data was only collected during the daytime. (West and DT Oakland only, selected days from 100×100)

	High NPF	Low NPF	All
Highways	0.55	0.78	0.74
Arterials	0.26	0.29	0.33
Residential	0.04	0.22	0.20

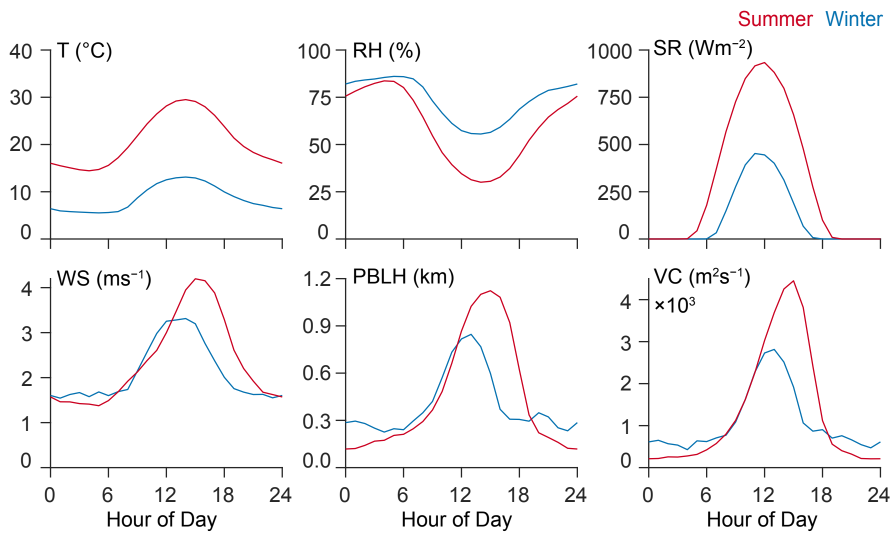


Fig. S1 Diurnal profiles of meteorological parameters — temperature, relative humidity, solar radiation, wind speed, planetary boundary layer height (PBLH) and ventilation coefficient (VC) — by season. Average values by season and hour of day are presented for all parameters. VC = PBLH × wind speed.

Fig. S2 Map showing the four fixed sites from this study.

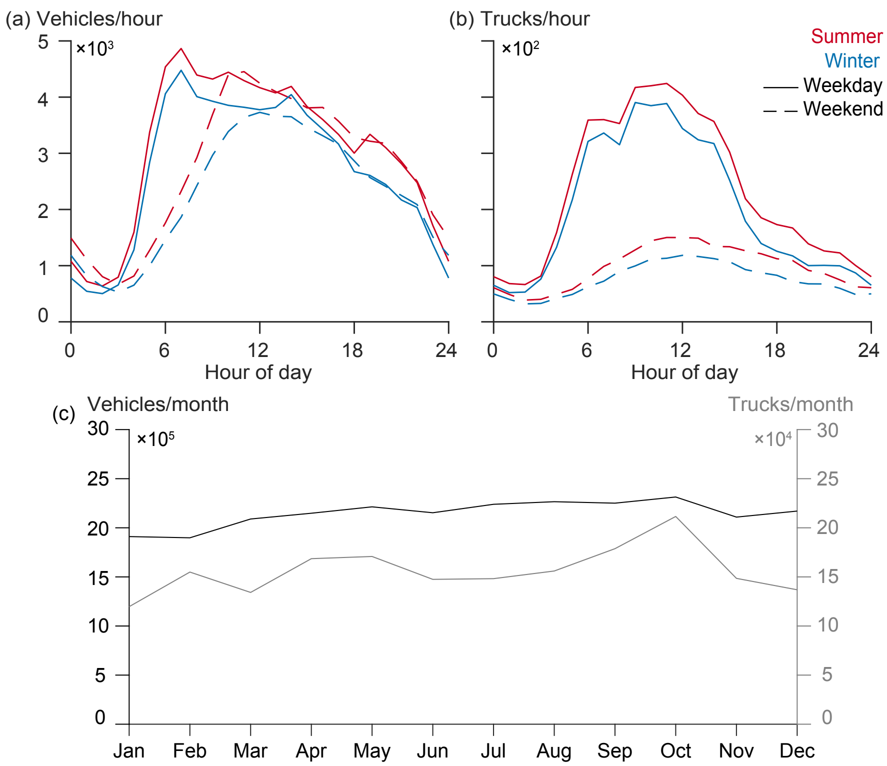


Fig. S3 Traffic data from Freeway Performance Measurement System (PeMS) operated by the California Department of Transportation (Caltrans). Summary for vehicle and truck volume at a PeMS station in Oakland (ID: 400218) close to the near-highway site used in this study. Summer-winter and weekday-weekend averages for 2015 for (a) vehicular traffic and (b) truck traffic. (c) Monthly averages of vehicular and truck traffic for a 5-year period (2014–2018).

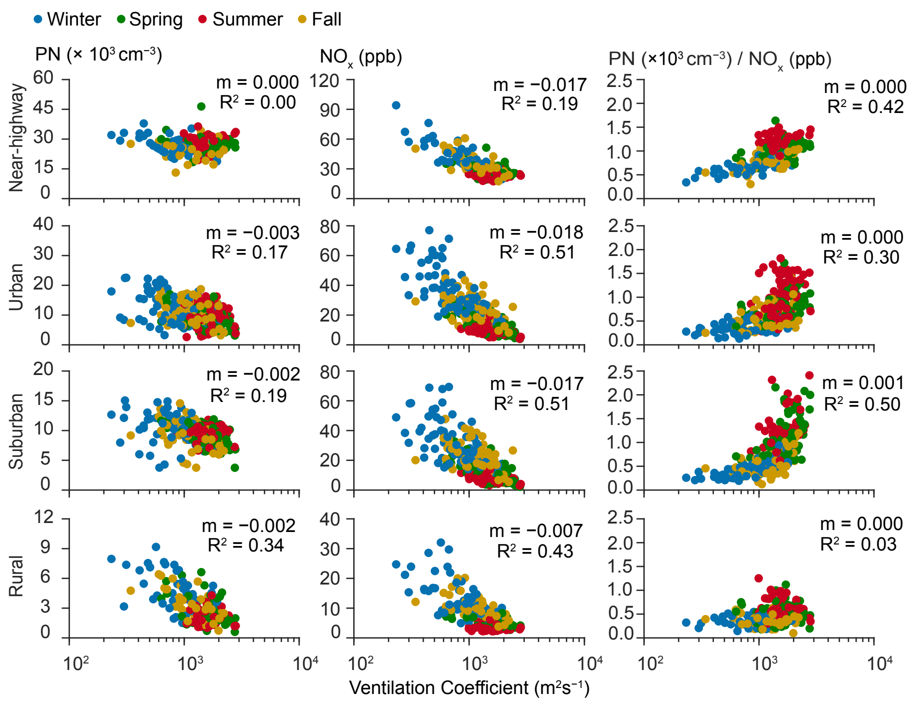


Fig. S4 Variations of PN and NO_x concentrations as a function of ventilation coefficient (PBLH × wind speed). Each scatter point is a weekly average and is color-coded with the month. We have also included the slope (m) and R^2 for the linear fit.

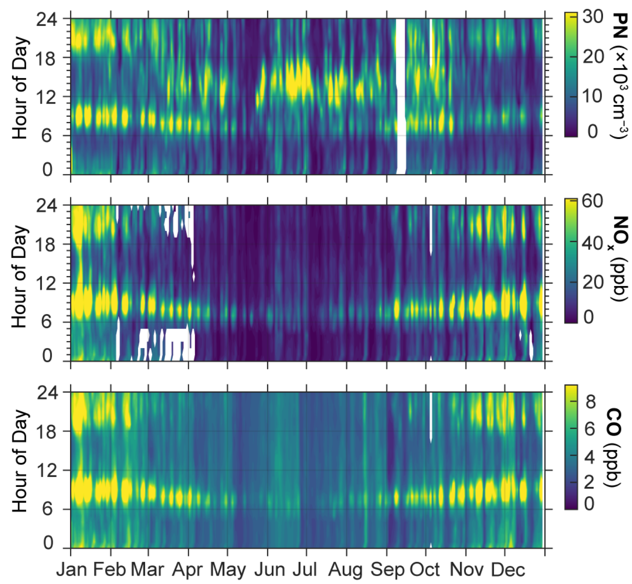


Fig. S5 PN, NO_x, and CO year-long (2015) concentrations for the urban site shown as heatmap. The colormap for each pollutant range from 0 to the 95th percentile of the hourly concentrations of that pollutant for the year and site presented.

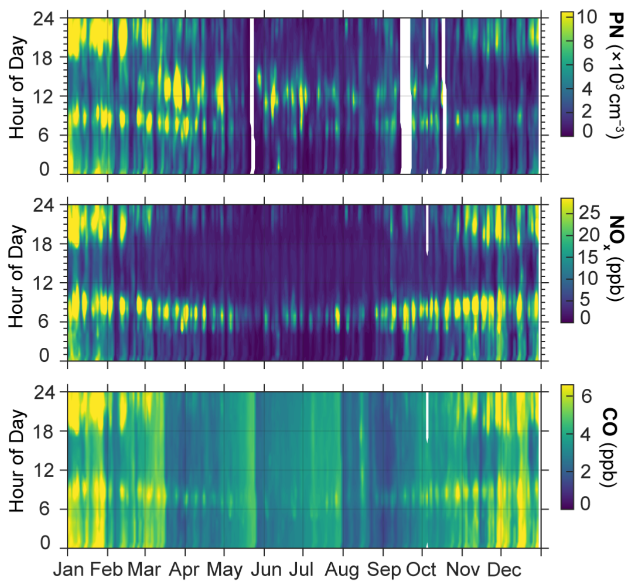


Fig. S6 PN, NO_x, and CO year-long (2015) concentrations for the rural site shown as heatmap. The colormap for each pollutant range from 0 to the 95th percentile of the hourly concentrations of that pollutant for the year and site presented.

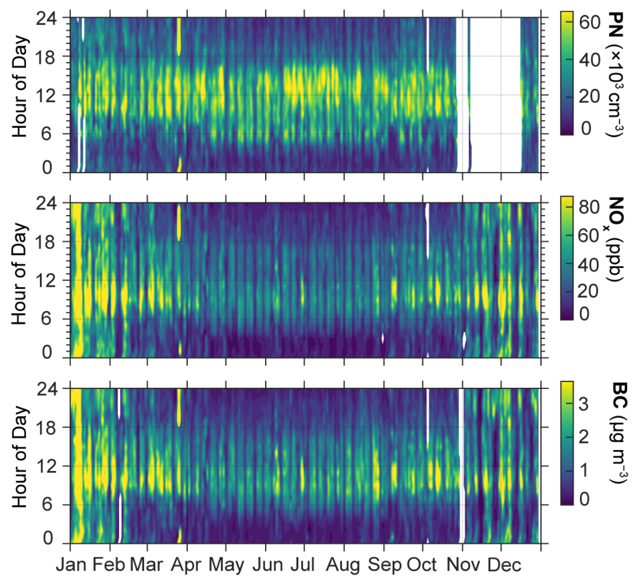


Fig. S7 PN, NO_x, and BC year-long (2015) concentrations for the near-highway site shown as heatmap. The colormap for each pollutant range from 0 to the 95th percentile of the hourly concentrations for the year and site presented.

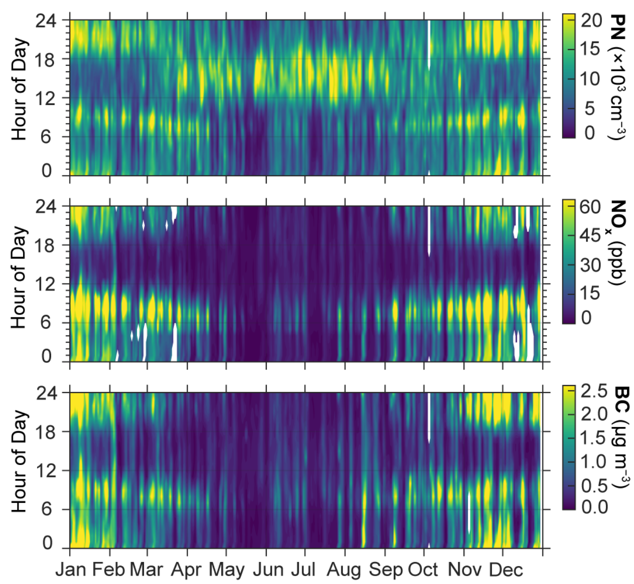


Fig. S8 PN, NO_x, and BC year-long (2015) concentrations for the suburban site shown as heatmap. The colormap for each pollutant range from 0 to the 95th percentile of the hourly concentrations of that pollutant for the year and site presented.

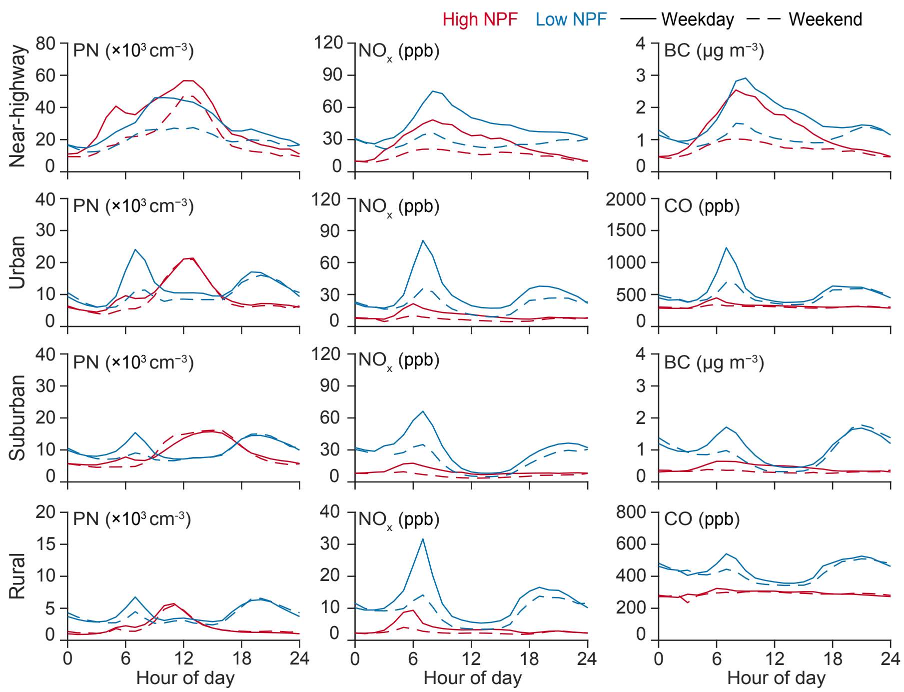


Fig. S9 Average diurnal variations of PN and NO_X for near-highway, urban, suburban, and rural sites by season (high NPF and low NPF months). Separated by weekday and weekend to illustrate role of changing traffic volumes. We also include another primary pollutant (BC or CO depending on data availability) for each site.

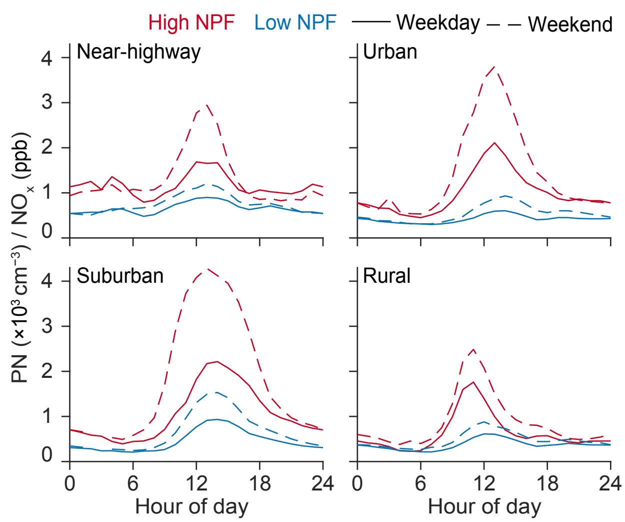
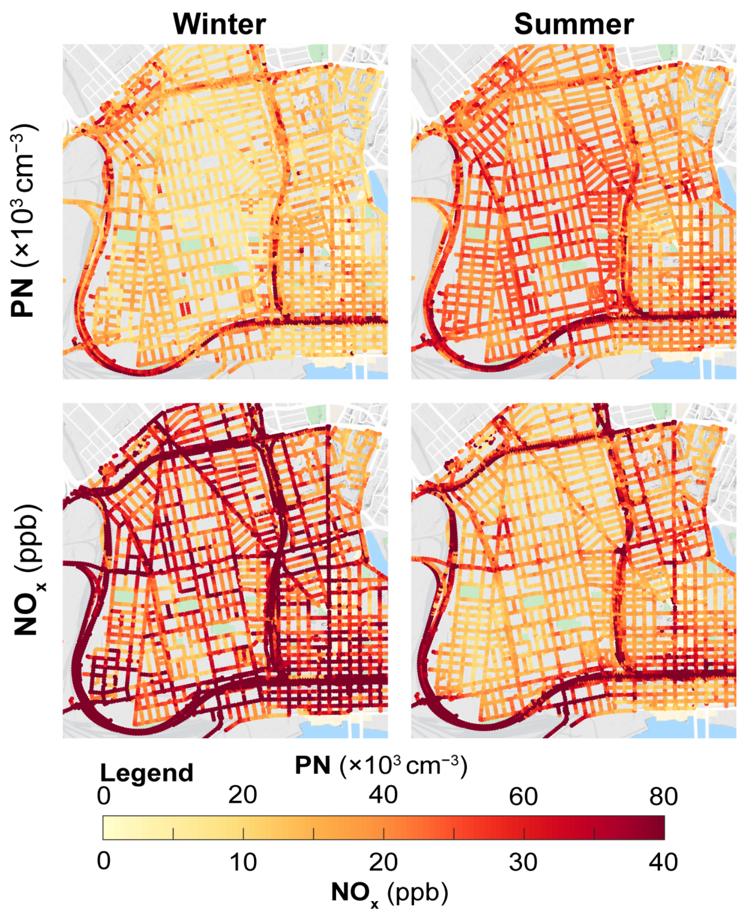


Fig. S10 Average diurnal variations for PN/NO_X ratio for near-highway, urban, suburban, and rural sites by season (high NPF and low NPF months). Separated by weekday and weekend to illustrate role of changing traffic volumes. The values presented are the ratio of the averages, and not the average of the ratios.



	Winter	Summer	Δ
Highways	47	53	6 (+13%)
Arterials	26	42	16 (+62%)
Residential	22	40	18 (+82%)

	Winter	Summer	Δ
Highways	71	44	−27 (−38%)
Arterials	40	24	−16 (−40%)
Residential	29	15	−14 (−48%)

Fig. S11 Median of drive pass mean of PN and NO_x for winter and summer. Averages by road type and change from winter to summer are also tabulated.

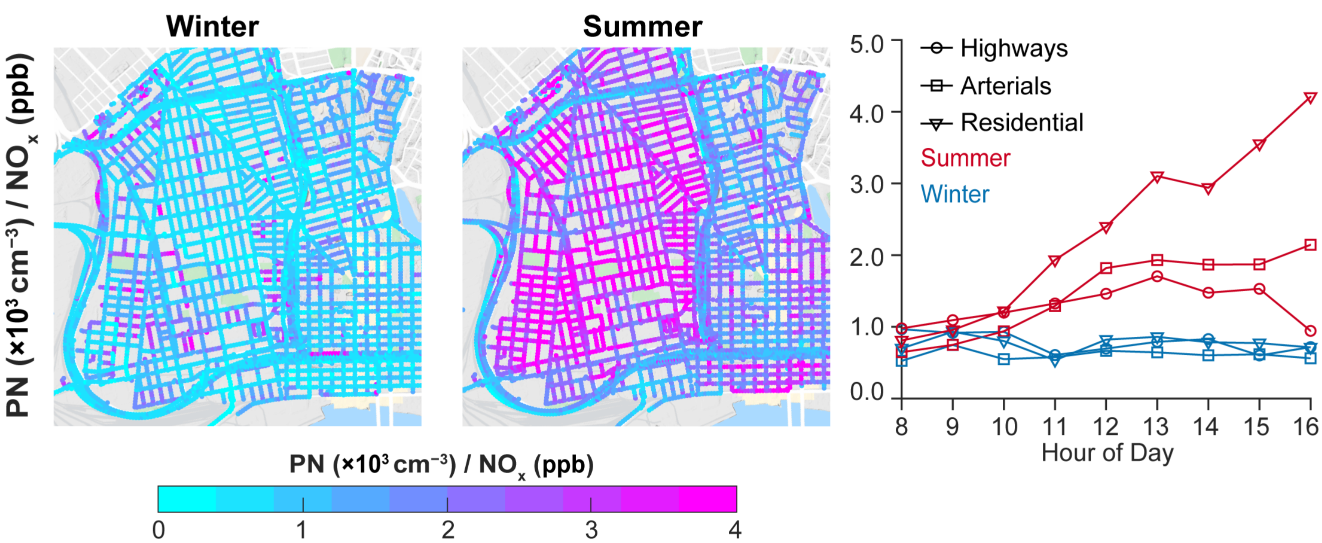


Fig. S12 Spatial map of PN/NO_x ratio for winter and summer. The diurnal variation of PN/NO_x ratio by road type are also presented. The values presented are the ratio of the averages, and not the average of the ratios.

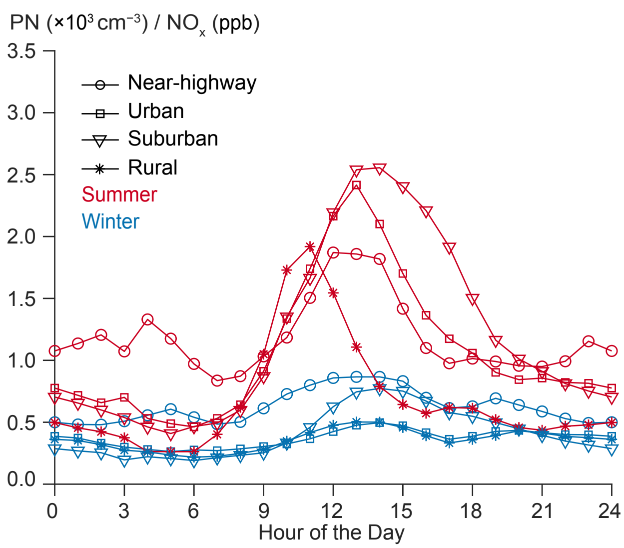


Fig. S13 Average diurnal variations for PN/NO_X ratio for near-highway, urban, suburban, and rural sites.

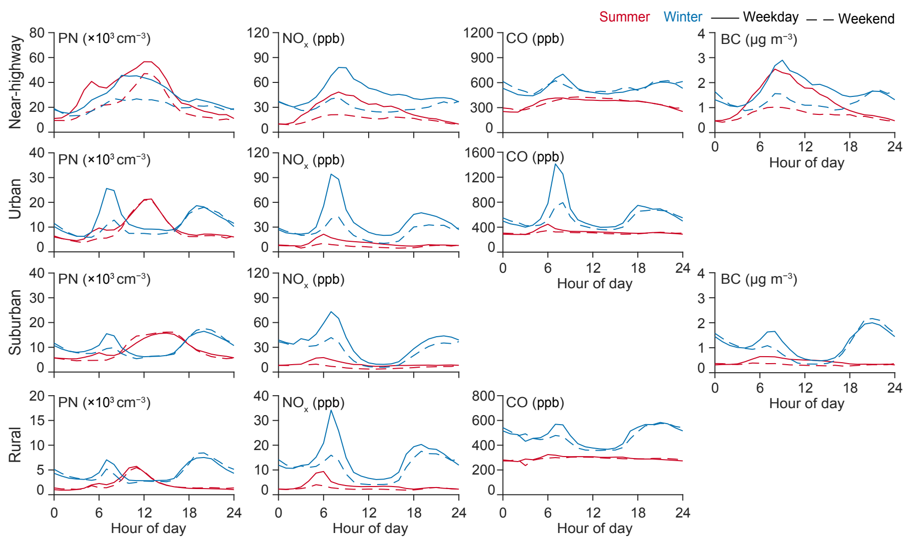


Fig. S14 Average diurnal variations of PN, NO_X, CO, and BC for near-highway, urban, suburban, and rural sites by season (summer and winter). Separated by weekday and weekend to illustrate role of changing traffic volumes. All available hourly data of TRAP concentrations from Jul-2011 to Jan-2018 was used for these calculations. BC or CO were not available for all sites.